CLAIMS

1. Plasma processing apparatus comprising:-

a chamber within which a substrate is processed in use;

a first electrode formed from a nickel alloy having substantially planar upper and lower surfaces, wherein the substrate is placed for processing upon the upper surface of the first electrode;

a second electrode;

a heater for heating at least the first electrode to a processing temperature; and

a power supply system arranged to cause an electrical discharge between the said first and second electrodes so as to produce the plasma in the chamber from one or more gases supplied to the chamber, characterised in that:-

the heater comprises one or more heating members arranged in a substantially planar manner, the heater and electrode forming an assembly such that the parts of the one or more heating members that are closest to the said upper surface of the first electrode, define a first plane that is separated from the upper surface by a distance Y, the parts of the one or more heating members that are furthest from the said upper surface of the first electrode, define a second plane, wherein the separation of the first and second planes defines a heater thickness X and wherein Y lies in the range 1.2X to 3X.

2. Apparatus according to claim 1, wherein the heater is arranged within the first electrode and wherein the second plane is separated from the lower surface of the electrode by a distance W, wherein a thickness Z of the combined electrode and heater assembly is given by Y+W+X; and wherein Z lies in the range 2Y to 2.5Y and Y lies in the range 1.2X to 3X.

3. Apparatus according to claim 1 or claim 2, further comprising a heat shield, positioned at the bottom surface of the assembly so as to reduce heat dissipation from the bottom part of the assembly.

4. Apparatus according to any of the preceding claims, wherein the nickel alloy comprises at least 99% by weight of nickel.

5. Apparatus according to any of the preceding claims, wherein the first electrode is adapted in use to be heated to 700°C from ambient temperature within substantially one hour or less, preferably 45 minutes or less.

6. Apparatus according to any of the preceding claims, wherein the first electrode is adapted to cool in use from 700 to 400°C in less than 30 minutes.

7. Apparatus according to any of the preceding claims, wherein the heater comprises a tubular, rod-like or foil heater.

8. A method of plasma cleaning the contents of a plasma processing chamber according to any of the preceding claims, the method comprising providing a fluorine-containing gas in the said chamber whilst the said

chamber is at an elevated temperature such that the chamber is cleaned by the action of the fluorine-containing gas.

9. A method according to claim 8, wherein the method comprises, prior to the introduction of the gas, using the chamber to perform plasma processing upon a substrate heated to a processing temperature.

10. A method according to claim 8 or claim 9, wherein the chamber is maintained at a predetermined temperature during cleaning.

11. A method according to claim 8 or claim 9, wherein the chamber is allowed to cool during cleaning.

12. A method according to any of claims 8 to 11, wherein the elevated temperature is at least initially at substantially the processing temperature.

13. A method according to any of claims 8 to 12, wherein the elevated temperature is in the range 200°C to 800°C.

14. A method according to claim 13, wherein the temperature is in the range 400°C to 700°C.

15. A method according to any of claims 8 to 14, wherein the fluorine-containing gas comprises a mixture of CF4 and O2 in the respective ratios of 80% to 20% by volume.

16. A method according to any of claims 8 to 15, wherein the flow rate of the fluorine-containing gas is 150 standard cubic centimetres per minute.

17. A method according to any of claims 8 to 16, wherein the plasma cleaning step is performed using a low frequency component of between 50kHz and 450 kHz, and/or high frequency component of 13.56 MHz.

18. A method according to any of claims 8 to 17, wherein the plasma power range is between 50W and 300W.

19. A method of plasma processing comprising positioning a substrate in contact with the upper surface of the first electrode in a plasma processing chamber of plasma processing apparatus according to any of claims 1 to 7, supplying one or more process gases to the chamber and generating a plasma within the chamber from the process gas(es), using the first and second electrodes so as to plasma process the substrate.

20. A method according to any of claims 8 to 19, wherein the plasma process comprises a deposition or etching process.

21. A method according to any of claims 8 to 20, wherein the deposition is of an electrically insulating material.